CLAIM AMENDMENTS

1   1.   (currently amended)   A method of measuring a wall

2   thickness of a pipe in a pipe rolling line, comprising the steps

3   of:

4   (a) launching an ultrasonic pulse into a wall of a pipe

5   whereby an ultrasonic wave is transmitted across a thickness of

6   said wall and an ultrasonic echo is returned to a surface of the

7   pipe;

8   (b) training a laser beam from an illuminating laser onto

9   said surface whereby a laser-light reflection from said surface is

10   modulated by said echo;

11   (c) collecting laser light reflected from said surface

12   and modulated by said echo as an input optical signal and feeding

13   said input optical signal to a Fabry-Pérot interferometer having

14   two mirrors spaced apart by a predeterminable distance (a), said

15   Fabry-Pérot interferometer having an output optical signal;

16   (d) passing said output optical signal to a first

17   photodiode and converting said output optical signal into an

18   electrical signal and evaluating said electrical signal to

19   determine transit time for echoes spanning the thickness of said

20   pipe and, from said transit time and a speed of sound in material

21   of the pipe, said wall thickness;

22   (e) at least one of the steps of:

23   (e$_1$) deriving a photodiode-measurement control

24   signal from said electrical signal,

25   (e₂) deriving a input-measurement control signal

26   from said input optical signal, and

27   (e₃) deriving a rolling-line control signal

28   representing a fabrication process variable;

29   (f) controlling a linear actuator determining a position

30   of at least one of said mirrors directly or indirectly through a

31   controller for said linear actuator with at least one of said

32   control signals; [[and]]

33   (g) regulating said photodiode with the output from a

34   variable amplification amplifier; and

35   (h) during steps (e), (f), and (g)

36   (h₁) varying a signal measured by said first

37   photodiode as a function of the input optical

38   signal as measured by a second photodiode and

39   feeding the varied signal to said controller,

40   each of said first and second photodiodes

41   having respective amplifiers for amplifying the

42   signals measured thereby, and

43   (h₂) controlling the amplifiers in a respective

44   control circuit based upon at least one

45   predeterminable command variable.

     2.   (canceled)

1   3.   (currently amended)   The method defined in claim

2   [[2]] 1 wherein the amplification of said amplifiers is controlled

3   in dependence upon a signal from said second photodiode in said

4   respective control circuit in response to one of said command

5   variables [[(FR)]].

1   4.   (currently amended) The method defined in claim

2   [[2]] 1 wherein a signal from said first photodiode is varied in

3   dependence upon a measured temperature of said pipe before it is

4   fed to said controller.

1   5.   (currently amended) The method defined in claim

2   [[2]] 1 wherein the amplification of at least one of said

3   amplifiers is controlled in dependence upon a disturbance variable

4   (z) applied to at least one of said amplifiers through at least one

5   adder.

1   6.   (currently amended) The method defined in claim 5

2   wherein said disturbance variable (z) is a measured temperature (T)

3   of said pipe.

1   7.   (original) The method defined in claim 4 wherein

2   pipe temperature is measured with a pyrometer.

1   8.   (currently amended) The method defined in claim

2   [[2]] 1 wherein said controller is a high-dynamic regulator acting

3   upon said linear actuator.

1   9. (currently amended) The method defined in claim

2   [[2]] 1 wherein said controller is a regulator applying PID control

3   to said linear actuator.

1   10. (currently amended) The method defined in claim

2   [[2]] 1 wherein the control circuits for said amplifiers are

3   operated with high dynamic controllers.

1   11. (currently amended) The method defined in claim

2   [[2]] 1, further comprising applying PID control to at least one of

3   said amplifiers.

1   12. (currently amended) The method defined in claim

2   [[2]] 1, further comprising applying PI control to at least one of

3   said amplifiers.

1   13. (currently amended) The method defined in claim

2   [[2]] 1, further comprising the step of defining at least one of

3   said command variables by stepwise scanning of a course of

4   functional response of the respective control circuit prior to use

5   thereof in a wall thickness determination of a rolled pipe.

        14. (canceled)

1   15. (currently amended) A device for measuring a wall

2   thickness of a pipe in a pipe rolling line, the device comprising:

3   a laser ultrasonic measuring unit having an excitation

4   laser trained on a surface of a pipe for launching an ultrasonic

5   pulse into a wall of the pipe whereby an ultrasonic wave is

6   transmitted across a thickness of said wall and an ultrasonic echo

7   is returned to the surface of the pipe, an illuminating laser

8   directing a laser beam onto said surface whereby a laser-light

9   reflection from said surface is modulated by said echo, and an

10 interferometer receiving laser light reflected from said surface

11 and modulated by said echo as an input optical signal and having

12 two mirrors spaced apart by a predeterminable distance (a), said

13 interferometer having an output optical signal evaluatable to

14 determine transit time for echoes spanning the thickness of said

15 pipe and, from said transit time and a speed of sound in material

16 of the pipe, said wall thickness, said interferometer having a

17 linear actuator for relatively displacing said mirrors to adjust

18 said distance; and

19   a control system acting upon said linear actuator and

20 including:

21   a first photodiode receiving said output optical

22   signal,

23   a controller responsive to a signal obtained from

24   said first photodiode and controlling said

25   linear actuator, and

26   a second photodiode receiving said input optical

27   signal,

28   respective amplifiers connected to said photodiodes

29   for amplifying respective signals measured

30   thereby, and

31   a control circuit including a further controller for

32   regulating amplifications of said amplifiers to

33   predetermined values.

1   16.   (original) The device defined in claim 15 wherein

2   at least one of said amplifiers is connected to an adder for

3   introducing a disturbance parameter as a control factor for the

4   respective amplifier.

1   17.   (original) The device defined in claim 15, further

2   comprising a pyrometer for measuring the temperature of said pipe

3   and providing an input to at least one of said controllers.

1   18.   (original) The device defined in claim 15 wherein

2   at least one of said amplifiers has a logarithmic characteristic.

1   19.   (currently amended) The device defined in claim 15

2   wherein said circuit includes a tolerance former for determining a

3   difference between the measured signal of said <u>first photodiode and</u>

4   <u>the measured signal of said second photodiode</u> ~~photodiodes~~ and

5   feeding a difference signal to the controller responsive to the

6   signal obtained from said first photodiode.

1   20.   (original) The device defined in claim 15, further

2   comprising a vibration-damped support for said interferometer.

1   21.   (original) The device defined in claim 20 wherein

2   said support has vibration-absorbing feet on a bottom side thereof.

1   22.   (original) The device defined in claim 21 wherein

2   said support has an enclosure for said interferometer enclosing

3   said interferometer from all sides.

1   23.   (original) The device defined in claim 22 wherein

2   said enclosure is composed of wood.

1   24.   (original) The device defined in claim 22 wherein

2   said support is provided on inner sides with plate-shaped damping

3   elements.

1   25.   (original) The device defined in claim 24 wherein

2   said damping elements are fibers of medium density.

1   26.   (original) The device defined in claim 24, further

2   comprising a foam between said plate-shaped damping elements and

3   inner sides of said support.